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XI. *Obſervations of the Solar Eclipſe of the 27th of October, 1780, made at* Newport, Rhode-Iſland, *by Monſ. de* GRANCHAIN. *Tranſlated from the* French, *and communicated by the Reverend Preſident* WILLARD.

	Times per Clock.			True Times.		
	h.	′	″	h.	′	″
THE inſtant when it was perceived that the eclipſe had began,*	9	24	32	11	0	12
Preceding limb of the ſun at the vertical,	11	21	39	0	57	27
Upper limb of the ſun at the horizontal,		21	54		57	42
Upper horn at the horizontal,		22	3		57	51
Limb of the moon at the vertical,		22	45		58	33
Upper horn at the vertical,		23	7		58	55
Lower horn at the vertical, doubtful,		23	35		59	23
Lower horn at the horizontal,		29	31	1	5	20
Lower limb of the ſun at the horizontal,		31	2		6	51
Preceding limb of the ſun at the vertical,	11	37	12	1	13	1
Upper limb of the ſun at the horizontal,		37	59		13	48
Upper horn at the horizontal,		38	32		14	21
Limb of the moon at the vertical,		paſſed,				
Upper horn at the vertical,		38	57		14	46
Lower horn at the vertical,		39	19		15	8
Lower horn at the horizontal,		43	38		19	28
Lower limb of the ſun at the horizontal,		45	27		21	17

N. B. The apparent upper and lower limb of the planet, in the teleſcope of the quadrant, which inverts objects, is here called the upper and lower limb.

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[*] When it was perceived that an impreſſion was made upon the limb of the ſun, the eclipſe had been begun 1′ 20″; therefore, the true beginning was at 10h 58′ 52″.

Preceding limb of the ſun at the vertical,	11h 47′ 8″	1h 22′ 58″
Upper limb of the ſun at the horizontal,	48 17	24 7
Limb of the moon at the vertical,	49 0	24 50
Upper horn at the vertical,	49 5	24 55
Upper horn at the horizontal,	49 7	24 57
Lower horn at the vertical,	49 21	25 11
Lower horn at the horizontal,	52 52	28 42
Lower limb of the ſun at the horizontal,	55 2	30 52
End of the eclipſe,	0 4 50	1 40 41
Latitude of the obſervatory upon *Goat-Iſland*,		41° 30 30

Obſervations of the lunar eclipſe of the 11th of Nov. 1780, made at *Newport*, (*Rhode-Iſland.*) By Monſ. de GRANCHAIN.

	Times per Clock.	True Times.
Beginning of the eclipſe,	7h 40′ 5″	10h 24′ 39″
Beginning of the immerſion of *Grimaldus*,	48 50	33 25
End of the immerſion of *Grimaldus*,	51 25	36 10
Beginning of the immerſion of *Tycho*,	8 0 36	10 45 12
The ſhadow of *Galileo*,	3 42	48 18
Beginning of the immerſ. of *Copernicus*,	27 54	11 12 31
End of the immerſion of *Copernicus*,	32 35	17 12
The ſhadow at the middle of *Dionyſius*,	46 55	31 33
The ſhadow at *Promontorium acutum*,	55 42	40 21
Copernicus begins to emerge,	9 17 54	12 2 34
Grimaldus begins to emerge,	22 2	6 42
Copernicus wholly emerges,	23 35	8 15
Grimaldus wholly emerges,	26 45	11 26
Promontorium acutum emer. from the ſhad.	51 12	35 55
Tycho wholly emerges from the ſhadow,	10 10 6	54 51
End of the eclipſe,	32 10	1 16 57

The

The ſame clock and quadrant were made uſe of in this obſervation, which had been uſed for the obſervation of the ſolar eclipſe. The going of the clock was, however, a little different, becauſe it had been altered.

ILLUSTRATIONS OF THE OBSERVATION OF THE SOLAR ECLIPSE.

The clock which was made uſe of to obtain the times, had a compound pendulum-rod, made by Monſ. *Berthoud*, a celebrated clock-maker at *Paris*. It was regulated many days before and after the obſervation, by correſponding altitudes, taken with a quadrant made by *Ramſden*, which was very good and very well divided.

The ſame quadrant was uſed in obſerving the tranſits of the horns, and of the limbs of the ſun and of the moon, acroſs the horizontal and vertical wires of the teleſcope, which was fitted for this purpoſe.

The obſerver, who, in putting on board the aſtronomical inſtruments, had nothing in view but the regulation of marine watches, was not ſo well provided with teleſcopes, as with time-pieces and quadrants. To obſerve the beginning and end of the eclipſe, he was obliged to make uſe of a ſimple achromatic ſea-glaſs, of three and an half feet focus. However, he believes he may anſwer for the end of the eclipſe, within four or five ſeconds nearly. The inſtant of the beginning is much more uncertain. A conſiderable impreſſion was made upon the ſun, before it was perceived. To determine, at leaſt, roughly, the true inſtant of the beginning of the eclipſe, an eſtimation was made, as near as might be, of the diſtance of the horns, at the moment when it was perceived that an impreſſion was made upon the diſc of the ſun; and towards the end of the eclipſe, it was obſerved how much time paſſed from the inſtant when the diſtance of the horns was ſenſibly the ſame, to the end of the eclipſe. It is in this manner that it was determined, that about 1′ 20″ muſt have intervened, between the true inſtant of the beginning of the eclipſe, and the time when the impreſſion was firſt obſerved.

At firſt it was thought uſeleſs to endeavour to obſerve the quantity of the eclipſe with the quadrant, becauſe of the ſlowneſs of the motion of the two planets vertically; however, upon reflection, it was thought that the tranſits of the horns, and of the limbs of the ſun and moon acroſs the vertical wire only, would be ſufficient to give the differences of the altitudes and azimuths of the centers of the two planets, and, conſequently, their differences of latitude and longitude. Theſe were, therefore, obſerved towards the end of the eclipſe, and at the ſame time, the tranſits acroſs the horizontal wire were obſerved, but without hoping that they could be of any great advantage, for calculating the diſtance of the centers.

In the firſt obſervation, the tranſit of the apparent lower horn acroſs the horizontal wire is a little doubtful: It may therefore be proper to perfer, in the calcule from this obſervation, the tranſit of the limb of the moon, and of the apparent upper horn, acroſs the ſame vertical wire.

In the ſecond obſervation, the inſtant of the tranſit of the limb of the moon acroſs the vertical wire was omitted, through hurry:—To calculate it, therefore, we may make uſe of the tranſit of the horn acroſs the ſame wire.

The laſt obſervation, being more complete, we may calculate it by the one or the other method, indifferently; or we may

may make uſe of the tranſits acroſs the horizontal wire, to deduce the difference of altitude, becauſe the motion of the two planets, vertically, was become leſs ſlow, when this obſervation was made.

If we would, in the firſt obſervation, verify the inſtant of the tranſit of the apparent lower horn acroſs the vertical wire, or know, in the ſecond obſervation, the inſtant of the tranſit of the limb of the moon acroſs the ſame wire, we may eaſily calculate them, with the aſſiſtance of the quantities already known. It will, perhaps, be uſeful to make this calculation, that we may be in a condition of determining the variation, which muſt have taken place, in the poſition of the two planets, obſerved relatively the one to the other, during the ſpace of time which intervened, between their tranſits acroſs the ſame wire.